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FETAL TRANSVERSE CEREBELLAR DIAMETER MEASUREMENT;

A USEFUL PREDICTOR OF GESTATIONAL AGE IN GROWTH RESTRICTED FETUSES

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ABSTRACT... Objective: To determine the accuracy of fetal transverse cerebellar diameter measurement in the prediction of gestational age in growth restricted fetuses. **Material and methods:** This controlled was conducted at Sobhraj Maternity Hospital, Karachi from July 2012 to June 2013. A total of 100 pregnant women in the third trimester of pregnancy satisfying the eligibility criteria were included. Among these 50 were fetuses with normal fetal growth and 50 growth restricted fetuses. **Results:** The mean transverse cerebellar diameter in the fetuses showing normal growth was not statistically different from the mean transverse cerebellar diameter in the growth restricted fetuses (p-value = 0.219). **Conclusions:** Transverse cerebellar diameter measurement can be used reliably for accurate estimation of gestational age in growth restricted fetuses.

Key words: Fetal transverse cerebellar diameter, Gestational age, intrauterine growth restriction.

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INTRODUCTION

Intrauterine growth restriction (IUGR) contributes significantly to overall perinatal morbidity and mortality[1]. Obstetric surveillance and management of such pregnancies and decision regarding the optimal timing of delivery in such pregnancies remains of paramount importance in fetal medicine[2,3]. Since clinical methods lack accuracy, prediction of gestational age based on sonographic fetal parameters is perhaps the cornerstone in modern obstetrics and continues to remain an important component in the management of pregnancies with growth restricted fetuses[4].

In addition to traditional biometry including biperietal diameter (BPD), head circumference (HC), abdominal circumference (AC) and femur length (FL), non-traditional sonographic measurements can help to accurately estimate gestational age at late gestation and specific clinical siruations, however the accuracy of some of these parameters is affected by growth abnormalities. Transverse cerebeller diameter (TCD) is emerging as a new non-traditional sonographic parameter and is claimed to be more accurate in certain situations like extremes of growth abnormalities and variations of fetal head shape such as dolicocephaly and brachycephaly[5,6,7].

The rationale of this study was to assess the usefulness of TCD as an independent parameter for gestational age assessment in IUGR fetuses in the third trimester of pregnancy as it has been shown that the cerebeller blood flow remains unimpaired in growth restricted fetuses.

MATERIAL AND METHODS

It was a case controlled study conducted at Sobhraj Maternity Hospital, Karachi. Due to time and resource constraints, we decided to select a sample of 100 pregnant women in the third trimester of pregnancy. We decided to keep equal number of women in both study arms, i.e. 50 women were fetuses with normal fetal growth and 50 women had growth restricted fetuses. IUGR was defined as having estimated fetal weight below 10th percentile for gestational age.

RESULTS

As evident from Table-I, mean maternal age in the group of normal fetuses was 25.5 and was 26.3 in the group of growth restricted fetuses. There is no significant difference in the maternal age between the two groups (p=0.33). Similarly there is no significant difference in the maternal parity between the normal and IUGR group (p=0.61) The mean gestational age in the normal group was 34.5 and 34.1 in the IUGR group. Again there was no significant difference in the gestational age between the normal and IUGR group (p=0.46).

Parameters	Normal fetuses (n=50)	IUGR fetuses (n=50)	P-value
	Mean (SD)	Mean (SD)	
Maternal age	25.5 (4.2)	26.3 (4.2)	0.33
Parity	1.2 (1.2)	1.1 (1.2)	0.61
Gestational age	34.5 (3.0)	34.1 (2.4)	0.46
TCD	35 (3.0)	33.9 (2.1)	0.221

Table-I. Feto-maternal characteristics

The mean TCD in the group of fetuses showing normal growth was 35.54 and the mean TCD in the group of IUGR fetuses was 33.9 with p-value 0.219 which shows that there is no statistically significant difference in the transverse cerebellar diameter measurements of the normal and the growth restricted fetuses. Increase in the TCD in both groups with increase in gestational age is very clearly depicted by the graph in Figure-1.

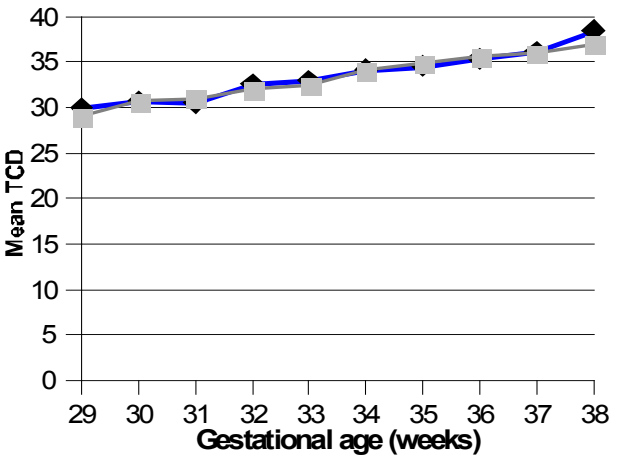

Figure-1. Relationship between TCD and gestational age

DISCUSSION

Accurate gestational dating is of paramount importance for management of pregnancies especially those with fetuses who have growth disturbances. IUGR is a common obstetrical problem related to 2-3 times increased perinatal mortality[8]. Clinical and technical methods for screening and assessment of IUGR lack accuracy and certainty[9]. Ultrasound shows more promise than any other clinical parameter for prediction of gestational age in growth restricted fetuses[4,9]. Different kind of biometric measurements have been evaluated alone or in combination for estimation of gestational age including BPD, AC, FL. One of the emerging nontraditional fetal ultrasound measurements (sonological parameter) is the transverse cerebeller diameter (TCD) especially in the asymmetrical IUGR where a brain sparing effect is seen with redistribution of fetal blood flow to vital organs like brain when the growth of rest of the body lags behind[10].

In this study fetal TCD measurements seem to correlate well with the gestational age in both normal and growth restricted fetuses as there was no significant difference in TCD measurements in normal and growth restricted fetuses. The TCD is an extremely useful marker as its measurement does not appear to vary significantly based on genetic programming and its measurement is independent of fetal head shape[11]. It demonstrates less of biologic variance seen in many other biometric parameters. Several studies have demonstrated that the TCD is spared in cases of intrauterine growth restriction[12,13,14]. It has been suggested that a preferential mechanism exists in the preservation of cerebellar growth relative to other cerebral structures[15]. This is consistent with nonhuman primate studies, demonstrating that blood flows are preferentially distributed to cerebellum, brainstem and midbrain instead of the cerebrum.

Inferences similar to this study have been drawn by other authors. Vinkesteijin and co-workers performed a retrospective analysis including 73 growth restricted fetuses and demonstrated that the TCD measurement is typically spared

in cases of IUGR[15]. More recently, Chavez and co-workers prospectively demonstrated that TCD measurement was both reliable and accurate in predicting gestational age even in extremes of fetal growth[4]. Whereas majority of data suggests that the TCD is extremely valuable when the gestational age is unknown or IUGR is suspected, Hill and co-workers reported that the TCD was within two standard deviations in only 40% of IUGR cases, however they include only 44 IUGR fetuses and symmetrical IUGR were not excluded[16]. Subsequently Lee and co-workers reported that the TCD was a useful predictor of gestational age for fetuses with asymmetric but not symmetric growth restriction[17].

A local study including 135 pregnant women with normal pregnancies concluded that TCD alone and in combination can give accurate idea of gestational age. It has been suggested that TCD/AC ratio can further improve assessment of gestational age on ultrasound[17].

The relationship of fetal gestational age and cerebellar growth is statistically significant. The fetal cerebellum grows in linear pattern in second trimester and the curve flattens in the third trimester[18]. The results of this and other studies on TCD measurement for gestational age assessment are encouraging. Additional improvement in accurate gestational dating can be achieved by incorporating results of TCD with some combination of other traditional fetal biometric parameters[9,18]. Nevertheless the best combination of biometric measurements remains to be determined[19].

Further large scale studies are required to corroborate our findings. Until the results of these studies become available, on the basis of encouraging results of this and previous studies we recommend that TCD can be used as an important sonographic biometric parameter in singleton IUGR fetuses for accurate prediction of gestational age as it does not need any further investigation or specialized

CONCLUSIONS

Transverse cerebellar diameter measurement can be used for significant improvement in the accuracy of gestational age estimation in growth restricted fetuses.

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